

Amendment and Response Under 37 C.F.R. §1.116 - Expedited Examining Procedure

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Serial No.: 09/942,200

Confirmation No.: 8194

Filed: August 29, 2001

For: DIFFUSION BARRIER LAYERS AND METHODS OF FORMING SAME

### Remarks

The Office Action of March 18, 2003 has been received and reviewed. With no claims having been added, amended, or cancelled, the pending claims remain claims 23-49. Reconsideration and withdrawal of the rejections are respectfully requested for at least the reasons below:

### Specification Amendment

The paragraph beginning at page 11, line 6, has been amended as described herein to import language from U.S. Serial No. 09/146,297, filed September 3, 1998, entitled "Method for Providing Low Carbon/Oxygen Conductive Layers" (hereinafter referred to as "Marsh"). Marsh later issued as U.S. Patent No. 6,284,655 B1. Marsh was incorporated by reference in the present application (see, e.g., page 11, lines 6-9, and page 17, lines 23-24).

In particular, the specification is hereby amended to indicate that the phrase "substantially carbon-free" refers to "an amount of carbon present in a layer that is preferably about 1.0% by atomic percent or less, more preferably about 0.1% by atomic percent or less, and most preferably about 0.05% by atomic percent or less." Support for this amendment may be found, for example, at page 4, lines 3-5, of Marsh.

"Instead of repeating some information contained in another document, an application may attempt to incorporate the content of another document or part thereof by reference to the document in the text of the specification. The information incorporated is as much a part of the application as filed as if the text was repeated in the application, and should be treated as part of the text of the application as filed. Replacing the identified material incorporated by reference with the actual text is not new matter." (M.P.E.P. § 2163.07(b), emphasis added).

As Marsh was incorporated by reference in the application as filed, it is submitted that this amendment does not introduce new matter. Moreover, as this amendment merely expressly states what was already incorporated by reference, Applicant submits that the amendment should be entered and fully considered prior to the issuance of any Official Communication.

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**The 35 U.S.C. § 112, First Paragraph, Rejection**

Claims 23, 27, and 32 were rejected under 35 U.S.C. § 112, first paragraph, as containing subject matter which was not described in the specification in such a way as to reasonably convey to one skilled in the relevant art that the inventor(s), at the time the application was filed, had possession of the claimed invention. In particular, the Office Action alleges that the phrase "further wherein the barrier layer is substantially free of carbon," is not supported by the originally filed application and hence is deemed to be new matter. Applicants traverse this rejection.

Applicants submit that the phrase "further wherein the barrier layer is substantially free of carbon," was properly imported into the specification from Marsh in a previous Response (see e.g., Response submitted 21 January 2003).

"To satisfy the written description requirement, an applicant must convey with reasonable clarity to those skilled in the art that, as of the filing date sought, he or she was in possession of the invention, and that the invention, in that context, is whatever is now claimed," (see M.P.E.P. § 2163.02). As discussed herein above though, instead of repeating information contained in another document, the content of the document, or part thereof, may be incorporated by reference in the text of the specification. "The information incorporated is as much a part of the application as filed as if the text was repeated in the application, and should be treated as part of the text of the application as filed," (see M.P.E.P. § 2163.07(b)).

As discussed above, the present application identifies Marsh, see e.g., page 11, lines 6-9, and incorporates Marsh by reference, see e.g., page 17, lines 23-24. Moreover, the present application has already been amended to explicitly incorporate subject matter from Marsh regarding the substantially carbon-free layer (see Response of 21 January 2003).

As Marsh describes a CVD method for forming a substantially carbon-free layer (see, e.g., col. 6, lines 11-13), Applicant submits that, with respect to claims 23, 27, and 32, the original application satisfies the requirements of 35 U.S.C. § 112, first paragraph. Specifically, the phrase "wherein the barrier layer is substantially free of carbon," does not introduce new

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matter as this information was present in the originally-filed application. Reconsideration and withdrawal of this rejection are requested.

### The 35 U.S.C. § 102 Rejections

Applicant notes that, contrary to the assertions of the Office Action (see page 2, last paragraph), the instant application was filed on 29 August 2001, i.e., after 29 November 2000.

### Claims 23-24 and 26-48

Claims 23-24 and 26-48 were rejected under 35 U.S.C. § 102(e) as being anticipated by Dornfest et al (U.S. Pat. No. 6,358,810). Of these claims, claims 23, 27, 32, and 37 are independent. Applicant traverses this rejection for at least the following reasons.

Independent claims 23, 27, and 32 each recite, for example, a chemical vapor deposited barrier layer that is substantially free of carbon. In contrast, Dornfest et al. teaches a top interface layer 50 that may include a combination of platinum and ruthenium, where the layer 50 may be formed by either a multi-metal PVD target or a CVD gas source (See col. 5, lines 16-25). No teaching is identified in Dornfest et al., however, of a chemical vapor deposited barrier layer that is substantially free of carbon.

"A claim is anticipated only if each and every element as set forth in the claim is found, either expressly or inherently described, in a single prior art reference." M.P.E.P. § 2131, citing *Verdegaal Bros. v. Union Oil Co. of California*, 814 F.2d 628, 631, 2 USPQ2d 1051, 1053 (Fed. Cir. 1987), emphasis added. Because Dornfest et al. does not teach each and every element of claims 23, 27, and 32, e.g., a chemical vapor deposited barrier layer that is substantially free of carbon, Dornfest et al. cannot anticipate either these claims or the claims that depend therefrom.

Further, for example, independent claim 37 provides an interconnect that includes a barrier layer formed of platinum(x):ruthenium(1-x) alloy. In contrast, Dornfest et al. teaches various capacitor structures. The embodiment of Dornfest et al. relied upon by the Examiner to reject claim 37 (i.e., FIG. 2) includes a capacitor 32a including an upper electrode 36, a lower electrode 38, and a high k dielectric or HDC layer 40 separating the upper and lower electrodes,

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(see Dornfest et al., column 4, lines 26-29). In other words, the alleged interconnect 38 is actually a lower electrode of capacitor 32a.

Claims 24, 26, 28-31, 33-36, and 38-48 -- each of which depend, either directly or ultimately, from one of independent claims 23, 27, 32, or 37 -- are not anticipated by Dornfest et al. for the same reasons as presented above for claims 23, 27, 32, and 37. In addition, these dependent claims each recite additional elements that further support patentability.

For at least the above reasons, Applicant submits that claims 23-24 and 26-48 are not anticipated by Dornfest et al. Reconsideration and withdrawal of this rejection are, therefore, requested.

**Claims 23, 26-27, 32, 37, 40-41, and 44-45**

Claims 23, 26-27, 32, 37, 40-41, and 44-45 were rejected under 35 U.S.C. § 102(e) as being anticipated by Wolters et al. In particular, the Office Action alleges that all the elements of the claimed invention are disclosed in Figure 6. (note: it is assumed that the Office Action is referring to Wolters et al., U.S. Patent No. 6,140,173, issued 31 October 2000. If this is incorrect, correction in the next Official Communication is requested).

Applicant traverses this rejection and submits that claims 23, 26-27, 32, 37, 40-41, and 44-45 are not anticipated by Wolters et al. For example, independent claims 23, 27, and 32 each recite a chemical vapor deposited barrier layer that is substantially free of carbon. Wolters et al., on the other hand, teaches a capacitor having a lower electrode 11 that includes a ruthenium layer 110 with approximately 25% platinum, and a platinum layer 111 that includes approximately 15-20% ruthenium. See Wolters et al., column 7, lines 5-8. These layers are formed by sputtering a ruthenium layer followed by sputtering a platinum layer on the ruthenium layer. See *id.* at column 6, line 66-column 7, line 3. The layers are then baked to produce the ruthenium/platinum and platinum/ruthenium layers 110 and 111, respectively. Yet there is nothing identified in Wolters et al. of a chemical vapor deposited barrier layer that is substantially free of carbon as recited in claims 23, 27, and 32. Therefore, Wolters et al. cannot anticipate these claims or the claims that depend therefrom.

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Moreover, Wolters et al. is silent with regard to carbon content. Thus, for the same reasons enumerated above with respect to Dornfest et al., any assertion that the bottom electrode layer 111 is carbon-free is unsupported.

Further, for example, claim 37 recites an interconnect that includes a barrier layer formed of platinum(x):ruthenium(1-x) alloy. In contrast to claim 37, the embodiment of Wolters et al. relied upon by the Examiner to reject claim 37 (i.e., FIG. 6) is a capacitor as described above. In other words, Wolters et al. does not teach a structure as claimed in claim 37.

Claims 26, 40-41, and 44-45, which depend, either directly or ultimately, from one of independent claims 23, 27, 32, or 37, are not anticipated by Wolters et al. for the same reasons as presented above for claims 23, 27, 32, and 37. In addition, claims 26, 40-41, and 44-45 each recite additional elements that further support patentability.

For at least the above reasons, Applicant submits that claims 23, 26-27, 32, 37, 40-41, and 44-45 are not anticipated by Wolters et al. Reconsideration and withdrawal of this rejection are therefore requested.

#### Claims 23, 26-27, 32, and 37

Claims 23, 26-27, 32, and 37 were rejected under 35 U.S.C. § 102(e) as being anticipated by Kawakubo et al. (U.S. Pat. No. 5,691,219). Applicant traverses this rejection and submits that claims 23, 26-27, 32, and 37 are patentable because Kawakubo et al. fails to teach each and every element of these claims.

For example, each of claims 23, 26-27, and 32 recite a chemical vapor deposited barrier layer that is substantially free of carbon. In contrast, the embodiment of Kawakubo et al. relied upon by the Examiner (i.e., FIG. 5E) teaches a semiconductor memory device including a bottom electrode 13 made of a platinum/ruthenium alloy deposited by DC sputtering (see Kawakubo et al., column 9, lines 32-34), not chemical vapor deposition. In other words, Kawakubo et al. does not teach each and every element of claims 23, 26-27, and 32.

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Further, Kawakubo et al. is silent with regard to carbon content. Thus, for the same reasons enumerated above with respect to Dornfest et al., any assertion that the bottom electrode electrode 13 is substantially carbon-free is unsupported.

Applicant further notes that claim 37 recites an interconnect that includes a barrier layer formed of platinum(x):ruthenium(1-x) alloy. In contrast to claim 37, the embodiment of Kawakubo et al. relied upon by the Examiner (i.e., FIG. 5E) teaches a semiconductor memory device including a bottom electrode 13 made of a platinum/ruthenium alloy deposited by DC sputtering. In other words, Kawakubo et al. does not teach a structure as claimed in claim 37.

For at least the above reasons, Applicant submits that claims 23, 26-27, 32, and 37 are not anticipated by Kawakubo et al. Reconsideration and withdrawal of this rejection are therefore requested.

#### **The 35 U.S.C. § 103(a) Rejection**

Claims 25 and 49 were rejected under 35 U.S.C. § 103(a) as being unpatentable over Dornfest et al. or Kawakubo et al. Applicant traverses this rejection and submits that claims 25 and 49 are patentable over Dornfest et al. or Kawakubo et al. for at least the following reasons.

To establish a *prima facie* case of obviousness, three basic criteria must be met. First, there must be some suggestion or motivation, either in the references themselves or in the knowledge generally available to one of ordinary skill in the art, to modify the reference or to combine reference teachings. Second, there must be a reasonable expectation of success. Finally, the prior art references must teach or suggest all the claim limitations (*see* M.P.E.P. § 2143).

Claims 25 and 49 are not *prima facie* obvious because, for example, neither Dornfest et al. nor Kawakubo et al. teach or suggest all of the elements of such claims. For example, claim 25 ultimately depends from claim 23 and thus includes all of the elements of that claim. As stated above in the response to the 35 U.S.C. § 102(e) rejection of claim 23, Dornfest et al. does not teach all of the elements of claim 23 (e.g., a chemical vapor deposited barrier layer that is substantially free of carbon). Further, as also stated above, Kawakubo et al. does not teach every

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element of claim 23 (e.g., a chemical vapor deposited barrier layer that is substantially free of carbon). Moreover, neither of these documents suggest these missing claim elements (e.g., a chemical vapor deposited barrier layer that is substantially free of carbon). Therefore, neither Dornfest et al. nor Kawakubo et al. render claim 25 *prima facie* obvious.

Further, for example, claim 49 ultimately depends from claim 37 and, therefore, includes all of the elements of claim 37. As stated above, neither Dornfest et al. nor Kawakubo et al. teaches all of the elements of claim 37 (e.g., an interconnect including a barrier layer). As a result, neither Dornfest et al. nor Kawakubo et al. render claim 49 *prima facie* obvious.

For at least the above reasons, Applicant submits that claims 25 and 49 are not *prima facie* obvious in view of the cited references. Reconsideration and withdrawal of this rejection are therefore requested.

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It is submitted that pending claims 23-49 are in condition for allowance and notification to that effect is respectfully requested. The Examiner is invited to contact Applicant's Representatives, at the below-listed telephone number, if it is believed that prosecution of this application may be assisted thereby.

Respectfully submitted for  
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**CERTIFICATE UNDER 37 CFR §1.8:**

The undersigned hereby certifies that this paper is being transmitted by facsimile in accordance with 37 CFR §1.6(d) to the Patent and Trademark Office, addressed to MAIL STOP AF, Commissioner for Patents, P.O. Box 1450, Alexandria, VA 22313-1450, on this 20<sup>th</sup> day of MAY, 2003, at 2:50pm (Central Time).

By:

Name: SARA E. OLSON



**APPENDIX A - SPECIFICATION/CLAIM AMENDMENTS  
INCLUDING NOTATIONS TO INDICATE CHANGES MADE**

Serial No.: 09/942,200

Docket No.: 150.00640102

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Amendments to the following are indicated by underlining what has been added and bracketing what has been deleted.

**In the Specification**

The replacement paragraph inserted at page 11, line 6, differs from the previous version as follows:

-- Methods of forming the co-deposited platinum:ruthenium alloy layer 14 are described in co-pending patent application entitled "Method for Producing Low Carbon/Oxygen Conductive Layers" having U.S. Serial No. 09/146,297, filed September 3, 1998, and issued as U.S. Patent No. 6,284,655 B1. For example, one such method includes forming a substantially carbon- and oxygen-free conductive layer in an oxidizing atmosphere in the presence of an organometallic catalyst using a chemical vapor deposition process. One skilled in the art will recognize that these methods and various other methods may be used to form the platinum:ruthenium alloy layer 14 according to the present invention. As used herein, "substantially carbon-free" refers to an amount of carbon present in a layer that is preferably about 1.0% by atomic percent or less, more preferably about 0.1% by atomic percent or less, and most preferably about 0.05% by atomic percent or less. --